GENERAL NOTES:

A. FOR MECHANICAL HVAC NOTES, LEGENDS, AND ABBREVIATIONS, SEE SHEETS M-900001B THRU M-900007B.

1.4 VARIABLE AIR VOLUME - TERMINAL UNIT (TYPICAL):

1. RUN CONDITIONS - SCHEDULED: UNIT SHALL RUN ACCORDING TO USER DEFINABLE TIME SCHEDULE IN FOLLOWING MODES:
   a. UNIT SHALL MAINTAIN:
      1) 78 DEG F (ADJUSTABLE) COOLING SET POINT.
      2) 68 DEG F (ADJUSTABLE) HEATING SET POINT.
2. ALARMS SHALL BE PROVIDED AS FOLLOWS:
   a. HIGH ZONE TEMP: IF ZONE TEMPERATURE IS GREATER THAN COOLING SET POINT BY USER DEFINABLE AMOUNT (INITIAL SET POINT OF 80F).
   b. LOW ZONE TEMP: IF ZONE TEMPERATURE IS LESS THAN HEATING SET POINT BY USER DEFINABLE AMOUNT (INITIAL SET POINT OF 65F).
3. ZONE SET POINT ADJUST: OCCUPANT SHALL BE ABLE TO ADJUST ZONE TEMPERATURE HEATING AND COOLING SET POINTS AT ZONE SENSOR, EXCEPT FOR VAV-90041008. THE VAV-90041008 SHALL RECEIVE THE AVERAGE TEMP SIGNAL FROM ROOM 108 THRU 112 AND MODULATE TO MAINTAIN PRESET SETPOINT AT BMS.
4. ZONE UNOCCUPIED: THE ZONE OCCUPANCY SENSOR SHALL REDUCE THE MINIMUM SETTING OF THE VAV BOXES TO 10% OF THE MAXIMUM FLOW. THIS APPLIES TO VAV BOX SERVING ROOMS WITH OCCUPANCY SENSOR.
5. REVERSING VARIABLE VOLUME TERMINAL UNIT - FLOW CONTROL: UNIT SHALL MAINTAIN ZONE SET POINTS BY CONTROLLING AIRFLOW THROUGH ONE OF FOLLOWING:
   a. OCCUPIED:
      1) WHEN ZONE TEMPERATURE IS GREATER THAN COOLING SET POINT, ZONE DAMPER SHALL MODULATE BETWEEN MINIMUM OCCUPIED AIRFLOW (ADJUSTABLE) AND MAXIMUM COOLING AIRFLOW (ADJUSTABLE) UNTIL ZONE IS SATISFIED.
      2) WHEN ZONE TEMPERATURE IS BETWEEN COOLING SET POINT AND HEATING SET POINT, ZONE DAMPER SHALL MAINTAIN MINIMUM REQUIRED ZONE VENTILATION (ADJUSTABLE).
      3) WHEN ZONE TEMPERATURE IS LESS THAN HEATING SET POINT (THE DAMPER IS ALREADY ITS SET MINIMUM POSITION), CONTROLLER SHALL ENABLE HEATING TO MAINTAIN ZONE TEMPERATURE AT HEATING SET POINT. ADDITIONALLY, THE HEATING SUPPLY AIR TEMPERATURE SHALL BE CONTROLLED TO 95 DEG F MAXIMUM BY INCREASING THE AIR FLOW TO MEET THE ZONE SET POINT.
6. HEATING COIL VALVE: CONTROLLER SHALL MEASURE ZONE TEMPERATURE AND MODULATE REHEATING COIL VALVE OPEN ON DROPPING TEMPERATURE TO MAINTAIN HEATING SET POINT.
7. DISCHARGE AIR TEMPERATURE: CONTROLLER SHALL MONITOR DISCHARGE AIR TEMPERATURE.

1.5 OUTSIDE AIR STATION:

1. OUTSIDE AIR CONDITIONS: OUTSIDE AIR STATION SHALL MONITOR OUTSIDE AIR TEMPERATURE. VALUES SHALL BE MADE AVAILABLE TO SYSTEM AT ALL TIMES.
   a. ALARM SHALL BE GENERATED WHEN SENSOR INDICATES SHORTED OR DISCONNECTED SENSOR. IN EVENT OF SENSOR FAILURE, ALTERNATE OUTSIDE AIR CONDITION INFORMATION SHALL BE MADE AVAILABLE FROM THE WEB.
2. OUTSIDE AIR TEMPERATURE HISTORY: CONTROLLER SHALL MONITOR AND RECORD HIGH AND LOW TEMPERATURE READINGS FOR OUTSIDE AIR. READINGS SHALL BE RECORDED ON DAILY, MONTH-TO-DATE, AND YEAR-TO-DATE BASIS.
3. COOLING DEGREE DAY: CONTROLLER SHALL PROVIDE DEGREE DAY HISTORY INDEX THAT REFLECTS ENERGY CONSUMPTION FOR FACILITIES COOLING DEMAND. COMPUTATIONS SHALL USE MEAN DAILY TEMPERATURE OF 65 DEG F (ADJUSTABLE). DEGREE DAY PEAK VALUE READINGS SHALL BE RECORDED ON DAILY, MONTH-TO-DATE, AND YEAR-TO-DATE BASIS.
4. HEATING DEGREE DAY: CONTROLLER SHALL PROVIDE DEGREE DAY HISTORY INDEX THAT REFLECTS ENERGY CONSUMPTION FOR FACILITIES HEATING DEMAND. COMPUTATIONS SHALL USE MEAN DAILY TEMPERATURE OF 65 DEG F (ADJUSTABLE). DEGREE DAY PEAK VALUE READINGS SHALL BE RECORDED ON DAILY, MONTH-TO-DATE, AND YEAR-TO-DATE BASIS.

1.6 UPS AND BATTERY ROOM HYDROGEN PANEL:

1. PROVIDE HYDROGEN SENSOR IN THE UPS AND BATTERY ROOM. IF HYDROGEN CONCENTRATIONS REACH 25% OF LOWER EXPLOSIVE LIMIT (LEL) OR THE LEVEL RECOMMENDED BY THE MANUFACTURER. SENSORS SHALL ALSO CAUSE AUDIBLE AND VISUAL ALARMS AT THE BMS CONTROL CONSOLE AND HYDROGEN CONTROL PANEL IN CORRIDOR. AUDIBLE ALARM SHALL BE EQUIPPED WITH SILENCE BUTTON. MOUNT A PERMANENT PLACARD WHICH IDENTIFIES THE ALARM. IN ADDITION, DRY ELECTRICAL RELAY CONTACTS SHALL CHANGE STATE FOR SENDING A FIRST STAGE SIGNAL TO FIRE ALARM CONTROL PANEL. IF HYDROGEN CONCENTRATIONS INCREASE TO 65% LEL, A LOCAL ALARM SHALL SOUND, AND ELECTRICAL CONTACTS SHALL CHANGE STATE FOR SENDING A 2ND STAGE (HIGH LEVEL) ALARM SIGNAL TO THE FIRE ALARM CONTROL PANEL AND THE DDC CONTROL CONSOLE. PROVIDE INTEGRAL TEST FUNCTIONS TO TEST ALARMS AND INTERNAL RELAYS.

1.7 CRITICAL ALARM REPORTING:

1. THE CRITICAL ALARMS AT BMS ARE AS FOLLOWS:
   a. RADAR PROCESSING ROOM, COMM CMC, AND MDCR ROOM TEMPERATURE ABOVE 80 DEGREES F.
   b. FUEL TANK LEVEL BELOW 60% LEVEL.
   c. ANY ROOM TEMPERATURE BELOW 35 DEGREES F.
   d. FACP FIRE ALARM.

1.8 DOMESTIC WATER PUMPS:

1. THE DOMESTIC PRESSURE IN THE PIPE SHALL BE MONITORED BY BMS.

1.9 FIRE PUMP STATUS:

1. THE ALARM STATUS OF THE FIRE PUMP SHALL BE REPORTED TO BMS, VIA FIRE PUMP CONTROL PANEL.

1.10 FIRE SMOKE DAMPERS (FSD):

1. FIRE SMOKE DAMPERS: THE FIRE SMOKE DAMPERS SHALL BE PROVIDED WITH END SWITCHES FOR MONITORING CAPABILITY. THE FACP SHALL BE PROGRAMMED TO EXERCISE THE DAMPERS AND DDC TO REPORT MALFUNCTIONING DAMPERS WHEN REQUIRED BY THE FACILITIES STAFF. THE REPORT OF EACH DAMPER FAILURE SHALL BE GENERATED FOR FACILITY MAINTENANCE PERSONNEL TO ADDRESS AND REPAIR THE DAMPERS THAT FAIL THE TEST. FSD SHALL BE ACTIVATED UPON DETECTION OF DUCT DETECTOR.

1.11 UNIT HEATER / CABINET UNIT HEATER (UH/CUH) CONTROL

1. UNIT HEATERS CONSIST OF A GLYCOL HEATING WATER COIL, AN ELECTRIC FAN, PIPING COMPONENTS AND MOTORIZED BALL VALVE. THE AREA TEMPERATURE TRANSMITTER SHALL BE SET TO MAINTAIN A SPACE TEMPERATURE. WHEN SPACE REQUIRES HEATING, THE CONTROL VALVE ALLOWING HEATING GLYCOL WATER TO FLOW THROUGH THE COIL AND THE UNIT HEATER FAN SHALL ENERGIZE.
2. WHEN THE SPACE TEMPERATURE IS 3 DEG F (ADJ) ABOVE THE SET POINT, THE CONTROL VALVE SHALL CLOSE AND THE UNIT HEATER FAN SHALL DE-ENERGIZE.
3. VALVE POSITION SHALL BE CONTROLLED BY THE DDC WITH THE ABILITY TO OPEN THE VALVE MANUALLY THROUGH THE DDC. WHEN THE VALVE RECEIVES AN OPEN COMMAND FROM THE DDC THE VALVE SHALL OPEN FOR ONE MINUTE AND SHALL CLOSE AGAIN.
4. SPACE TEMPERATURE SHALL BE MONITORED BY THE DDC WITH THE ABILITY TO MANUALLY OVERRIDE THE SPACE TEMPERATURE SETPOINT OF THE ROOM MOUNTED THERMOSTAT.

1.12 EMERGENCY VENTILATION SYSTEM SHUTOFF :

1. EMERGENCY HVAC SYSTEM SHUTOFF PUSHBUTTON LOCATED IN LOBBY 103, CORRIDOR 146 AND CORRIDOR 148 AND ACTION AS BMS SHALL :
   a. TURN OFF HRU, AND THEN ALL ASSOCIATED MOTORIZED DAMPERS MD-90041101 & 102.
   b. TURN OFF ALL EF EXCEPT BOILER FLUE FAN, WITH ASSOCIATED MOTORIZED DAMPERS.
   c. CLOSE ALL OUTSIDE AIR AND EXHAUST/RELIEF AIR DAMPERS, EXCEPT BOILER ROOM COMBUSTION INTAKE DAMPERS
2. THE CONTROL SYSTEM SHALL SHUT DOWN ALL ABOVE MENTIONED SYSTEMS AND CLOSE ALL REQUIRED DAMPERS, EVEN IF THE LOCAL HAND/OFF/AUTO SWITCH IS IN THE HAND POSITION, WITHIN 30 SECONDS OF SWITCH ACTIVATION. AN ALARM SHALL BE INDICATED AT THE BMS. THE ABOVE SEQUENCE SHALL ALSO ACTIVATE UPON EMERGENCY SIGNAL TO BMS.
3. ABOVE DESCRIBED EQUIPMENT SHALL TURN OFF FIRST, PRIOR TO RESPECTIVE DAMPER CLOSE-OFF.

1.13 SMOKE EXHAUST FAN - ON/OFF :

1. RUN CONDITIONS: SMOKE EXHAUST FANS SHALL RUN BY SIGNAL FROM THE DDC OR LOCAL PURGE PANEL. PRIOR TO FAN START ALL INLET AND DISCHARGE DAMPERS (MD & FSD) SHALL BE OVERRIDDEN AND OPEN. DISCHARGE MD SHALL REMAIN CLOSED WHEN SEF IS NOT ACTIVATED.
2. FAN STATUS: CONTROLLER SHALL MONITOR FAN STATUS. ALARMS SHALL BE PROVIDED AS FOLLOWS:
   a. FAN FAILURE: COMMANDED ON, BUT STATUS IS OFF.
   b. FAN IN HAND: COMMANDED OFF, BUT STATUS IS ON.

1.14 CRAC UNIT CRAC-90041001A, B, & C - (ONE STAND-BY):

1. RUN CONDITIONS - SCHEDULED: UNIT SHALL RUN ACCORDING TO USER DEFINABLE TIME SCHEDULE IN FOLLOWING MODES:
   a. OCCUPIED MODE: UNIT SHALL MAINTAIN:
      1) 72 DEG F (ADJUSTABLE) SET POINT. @ 45% ± 5% RELATIVE HUMIDITY
2. STANDARD CONDITIONS:
   a. ANY TWO OF THE THREE CRAC UNITS ARE ENERGIZED AT ALL TIMES. THE INTAKE DAMPER OF THE ACTIVE UNIT SHALL OPEN PRIOR TO START OF THE CRAC UNIT. THE DAMPER SHALL CLOSE WHEN THE UNIT DEACTIVATES.
   b. THE CRAC UNIT'S BUILT-IN CONTROLLER SHALL SENSE THE ROOM AIR TEMPERATURE AND HUMIDITY CONDITIONS, AND MAINTAIN THE SET POINT CONDITIONS.
   c. THE STAND-BY CRAC UNIT SHALL BE AUTOMATICALLY ENERGIZED IF THE ACTIVE UNIT FAILS.
   d. PROVIDE AUTOMATIC SWITCHOVER CAPABILITY ON AN ADJUSTABLE OPERATING SCHEDULE.
3. ALARM CONDITIONS:
   a. PROVIDE THE TROUBLE ALARM AT THE BUILDING BMS FOR THE FOLLOWING CONDITIONS:
      1) WHEN ROOM TEMPERATURE EXCEEDS 76 DEGREES F OR DROPS BELOW 68 DEGREES F.
      2) PRESSURE DROP IN CRAC UNIT FILTERS EXCEED THE SET POINT OF 0.3" WC.
      3) WHEN ANY OF THE OPERATING UNIT FAILS.
      4) WHEN THE WATER DETECTOR SENSES WATER UNDER THE FLOOR.
4. EMERGENCY ENGINE GENERATOR POWER: LOCK OUT ELECTRIC REHEAT AND HUMIDIFIER CONTROLS.
5. EMERGENCY SHUTDOWN: UNITS AND ALL TWELVE FSD SHALL SHUT DOWN AND GENERATE ALARM UPON RECEIVING EMERGENCY SHUTDOWN SIGNAL, FROM THE ROOM EPO SWITCH.
6. SMOKE DETECTION: UNITS AND ALL TWELVE FSD SHALL SHUT DOWN AND GENERATE ALARM UPON RECEIVING SMOKE DETECTOR OR CLEAN AGENT CONTROL PANEL SIGNAL.
7. FAN: FAN SHALL RUN ANYTIME UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES.
8. FILTER DIFFERENTIAL PRESSURE MONITOR: CONTROLLER SHALL MONITOR DIFFERENTIAL PRESSURE ACROSS FILTER. ALARMS SHALL BE PROVIDED AS FOLLOWS:
   a. FILTER CHANGE REQUIRED: FILTER DIFFERENTIAL PRESSURE EXCEEDS USER DEFINABLE LIMIT (ADJUSTABLE).
9. LEAK DETECTION: SPOT LEAK DETECTOR INSTALLED UNDER THE RAISED FLOOR SHALL PROVIDE LEAK SIGNAL.

1.15 CRAC UNIT CRAC-90041002A & 2B (TYPICAL FOR CRAC 3A & 3B, CRAC 4A &4B) - (ONE STAND-BY):

1. RUN CONDITIONS - SCHEDULED: UNIT SHALL RUN ACCORDING TO USER DEFINABLE TIME SCHEDULE IN FOLLOWING MODES:
   a. OCCUPIED MODE: UNIT SHALL MAINTAIN:
      1) 72 DEG F (ADJUSTABLE) SET POINT. @ 45% ± 5% RELATIVE HUMIDITY
2. STANDARD CONDITIONS:
   a. ANY ONE OF THE TWO CRAC UNITS ARE ENERGIZED AT ALL TIMES. THE DAMPER OF THE ACTIVE UNIT SHALL OPEN PRIOR TO START OF THE CRAC UNIT. THE DAMPER SHALL CLOSE WHEN THE UNIT DEACTIVATES.
   b. THE CRAC UNIT'S BUILT-IN CONTROLLER SHALL SENSE THE ROOM AIR TEMPERATURE AND HUMIDITY CONDITIONS, AND MAINTAIN THE SET POINT CONDITIONS.
   c. THE STAND-BY CRAC UNIT SHALL BE AUTOMATICALLY ENERGIZED IF THE ACTIVE UNIT FAILS.
   d. PROVIDE AUTOMATIC SWITCHOVER CAPABILITY ON AN ADJUSTABLE OPERATING SCHEDULE.
3. ALARM CONDITIONS:
   a. PROVIDE THE TROUBLE ALARM AT THE BUILDING BMS FOR THE FOLLOWING CONDITIONS:
      1) WHEN ROOM TEMPERATURE EXCEEDS 76 DEGREES F OR DROPS BELOW 68 DEGREES F.
      2) PRESSURE DROP IN CRAC UNIT FILTERS EXCEED THE SET POINT OF 0.3" WC.
      3) WHEN ANY OF THE OPERATING UNIT FAILS.
      4) WHEN THE WATER DETECTOR SENSES WATER UNDER THE FLOOR (EXCEPT CRAC-90041004A&B).
4. EMERGENCY ENGINE GENERATOR POWER: LOCK OUT ELECTRIC REHEAT AND HUMIDIFIER CONTROLS.
5. SMOKE DETECTION: UNITS, ASSOCIATED MD, AND FSD SERVING THE ROOM SHALL SHUT DOWN AND GENERATE ALARM UPON RECEIVING AREA SMOKE DETECTOR OR CLEAN AGENT CONTROL PANEL (FOR ROOMS 150 & 151).
6. FAN: FAN SHALL RUN ANYTIME UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES.
7. FILTER DIFFERENTIAL PRESSURE MONITOR: CONTROLLER SHALL MONITOR DIFFERENTIAL PRESSURE ACROSS FILTER. ALARMS SHALL BE PROVIDED AS FOLLOWS:
   a. FILTER CHANGE REQUIRED: FILTER DIFFERENTIAL PRESSURE EXCEEDS USER DEFINABLE LIMIT (ADJUSTABLE).
8. LEAK DETECTION (CRAC-2A, 2B, 3A & 3B): SPOT LEAK DETECTOR INSTALLED UNDER THE RAISED FLOOR SHALL PROVIDE LEAK SIGNAL.

1.16 EMI TEST ENCLOSURE TEMPERATURE CONTROL:

1. ROOM TEMPERATURE SET POINT:
   i. 72 DEG F (ADJUSTABLE) SET POINT.
2. SUPPLY AIR MOTORIZED DAMPER: THE DAMPER SHALL MODULATE TO MAINTAIN ROOM RETURN AIR TEMPERATURE. THE RETURN AIR TEMPERATURE SENSOR IS LOCATED ON THE ENCLOSURE'S RETURN AIR OPENING.

1.17 CLEAN AGENT DISCHARGE:

1. THE CLEAN AGENT CONTROL PANEL SHALL BE CONNECTED TO BUILDING DDC SYSTEM. PRIOR TO THE DISCHARGE OF THE CLEAN AGENT, ALL CRAC, FSD, AND MD SERVING THE ROOM SHALL SHUT OFF. ALL EQUIPMENT AND DAMPER SHALL RESET AFTER THE FIRE EVENT.

REGISTERED PROFESSIONAL ENGINEER — PEGGY PEIYI WU — No. M 30595 — EXP. 06-30-18 — MECHANICAL — STATE OF CALIFORNIA
11-18-16

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Symbol	No.	Action	Description	Date	By
1	AM09	READY TO ADVERTISE SUBMITTAL		2017.01.19	BTN
	AMENDMENT #09			2016.11.18	BTN

Designed: N.PATEL
Drawn: C.DECASTRO
Reviewed: P.WU
Submitted: BTN

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

AECOM + TETRA TECH JV

Date: 2016.11.18
Orig Scale: AS NOTED
Plot Scale: 1:1
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CLEAR AFS, ALASKA
LONG RANGE DISCRIMINATION RADAR
CONSTRUCTION PACKAGE 1 - VOLUME 2
MECHANICAL HVAC SEQUENCE OF OPERATIONS - SHEET 2 OF 3

Reference number:
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